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*Supplement of*


## **Exploring noise annoyance and sound quality for airborne wind energy systems: insights from a listening experiment**



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## Start screen of the experiment

Graphical User Interface for Psychoacoustic Listening Experiments

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Instructions:


Dear participant,


As already explained to you, the experiment consists of the following parts:

- An initial questionnaire about your hearing ability and well-being;
- The listening part with a practice round at the beginning;
- And a closing questionnaire asking, among other things, about your experience with wind energy technologies and demographic information.


If you have any questions throughout the experiment that are not answered by the instructions, please turn to the experimenter, who is waiting outside the room.

When you are ready to begin, click "Start Test".



Graphical User Interface for Psychoacoustic Listening Experiments

Before we can start, we have a few questions about your hearing ability and well-being. Your answers help us decide whether you are fit to participate in this study. So please answer the following questions truthfully. Remember that your responses are anonymous, meaning the experimenter will not know what you answered.



## ***Initial questionnaire***

In the graphical user interface, each question was displayed on a separate page (screenshots are not shown here to save space). The questions marked with “if yes/no” were only shown when one of the relevant previous questions was answered accordingly.

**How good do you think your hearing is?**

1	2	3	4	5
Excellent	Very good	Good	Fair	Poor

**Do you suffer from ringing in the ears (tinnitus)?**

Yes No

**Have you suffered or are you suffering from any ear disease?**

Yes No

*If yes:* **What kind of disease?** [Answer box]

**Have you had an accident involving your head that affected your hearing?**

Yes No

**Have you suffered a shooting or explosion injury (blast trauma)?**

Yes No

**Do you use a hearing aid?**

Yes

No

*If yes to the previous question: Are you wearing it right now?*

Yes

No

**Do you have to wear hearing protection at work, or did you have to in the past?**

Yes

No

*If yes to the previous question: What noise do/did you have to protect yourself from? [Answer box]*

**Do you currently have a cold?**

Yes

No

*If yes to the previous question: How bad is your cold?*

1  
Very weak

2  
Weak

3  
Moderate

4  
Somewhat strong

5  
Very strong

**Are you currently feeling well?**

Yes

No

*If no to the previous question: In what way are you not feeling well? [Answer box]*

**Are you currently feeling very tired?**

Yes

No

## Listening part



Next is the listening part. You will be presented with 25 different sound samples. Each sound sample will only be played once. After each sample, you will be asked to rate on a scale from “not at all” to “extremely” how bothered, disturbed, or annoyed you were by the noise you have heard. In addition, you will be asked to rate your annoyance on a numerical scale from 0 to 10.

Please work in a concentrated and attentive manner. We are interested in your personal assessment of the noise. For this reason, there are no right or wrong answers. If you are unsure which answer you should choose, please select the one that most applies to you.

We will start with one training exercise so you can get used to the process and the answering scale.



**This is a training exercise**

Play

Imagine you are at home and hearing the noise; how much does the noise bother, disturb or annoy you?

Not at all

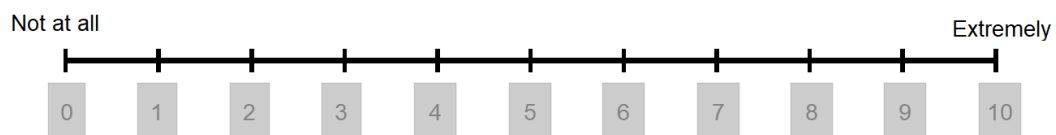
Slightly

Moderately

Very

Extremely

Imagine you are at home and hearing the noise; what number from 0 to 10 best shows how much you are bothered, disturbed or annoyed by the noise?





## ***Closing questionnaire***

Thank you for your attention during the listening part. Next, please rate the following statements. Imagine you are in the described situation and select the answer option that best applies to you.

	Strongly disagree	Slightly disagree	Slightly agree	Strongly agree
I need a completely quiet environment in order to have a good night's sleep.	0	1	2	3
I need a quiet environment to be able to carry out new tasks.	0	1	2	3
When I am at home, I quickly get used to noise.	0	1	2	3
I get very agitated when I hear somebody speaking when I am trying to sleep.	0	1	2	3
I am very sensitive to noise made by the neighbours.	0	1	2	3
When people around me are noisy, I find it hard to do my work.	0	1	2	3
I perform significantly worse in noisy environments.	0	1	2	3
I do not feel very alert when I have been bothered by noise the night before.	0	1	2	3
Living in a noisy street would not bother me.	0	1	2	3
I am prepared to accept disadvantages in order to live in a quiet place.	0	1	2	3
I need peace and quiet in order to carry out a difficult task.	0	1	2	3
I can sleep even if it is noisy.	0	1	2	3

Next, please tell us about your experience with wind turbines and wind energy. Select the answer option that best applies to you.

### **What is your attitude towards wind turbines in general?**

1  
Very negative

2  
Negative

3  
Neutral

4  
Positive

5  
Very positive

**Have you ever heard a wind turbine before this experiment?**

Yes

No

Don't know

**Do you live near a wind turbine or multiple wind turbines?**

Yes

No

Don't know

*If yes to the previous question:* **How close is the closest wind turbine to your house? If you don't know the exact distance, try to estimate it.**

1  
0 – 1.6 km

2  
1.6 – 4.8 km

3  
4.8 – 8 km

4  
More than 8km

*If yes to the question about living next to a turbine:* **To what extent do(es) the wind turbine(s) close to your home disturb the landscape?**

0  
Not at all

1  
Slightly

2  
Somewhat

3  
Moderately

4  
Very

*If yes to the question about living next to a turbine:* **Can you see wind turbines in whole or in part from any spot on your property or from inside your home?**

Yes

No

Don't know

*If yes:* **How many can you see?** [Answer box]

*If yes to the question about seeing wind turbines:* **Please rate the following statement. When I rated my annoyance at the wind turbine noise in this study, I pictured the wind turbine(s) close to my house.**

1  
Strongly disagree

2  
Disagree

3  
Neither agree nor disagree

4  
Agree

5  
Strongly agree

*If yes to the question about living next to a wind turbine:* **Can you hear noise from the wind turbine(s) inside your home?**


Yes

No

Don't know




If yes to the previous question:


 Graphical User Interface for Psychoacoustic Listening Experiments

Thinking about the last 12 months or so, when you are at home, what number from 0 to 10 best shows how much you are bothered, disturbed, or annoyed by the wind turbine noise? If you are not at all annoyed, choose 0; if you are extremely annoyed, choose 10; if you are somewhere in between, choose a number between 0 and 10.


Not at all Extremely

0 1 2 3 4 5 6 7 8 9 10


 Next

 Graphical User Interface for Psychoacoustic Listening Experiments

Are you familiar with any of the airborne wind energy systems shown in the photos? Please note: these are not glider aircraft or regular kites but rather wind energy technologies.



Yes No Don't know

 Next

<sup>1</sup> Image credits clockwise: Kitemill, Kitepower B.V., SkySails Group, kiteKRAFT GmbH.

*If yes to the previous question: Have you heard an airborne wind energy system before?*

Yes

No

Don't know

**What do you think the experiment is trying to measure?** [Answer box]

**How did you first hear about the experiment?**

- Advertisement on screens at TU Delft
- Poster at TU Delft
- Online event calendar of TU Delft
- Email newsletter of Aerospace Engineering Faculty
- Brightspace page for Aerospace Engineering students
- Uni-Life app
- LinkedIn
- Facebook
- Through a friend, colleague, family member etc.
- Other: \_\_\_\_\_

**What is your age?** [Slider from 0 to 100]

**What is your gender?**

- Male
- Female
- Other
- Prefer not to say

**What is the highest level of education you have completed?**

- Elementary (Kindergarten through primary school)
- Some High School (No Diploma)
- High School Graduate
- Some College, but No Degree
- Bachelor's Degree
- Master's Degree
- Doctorate

Thank you very much for participating in the experiment. We appreciate your time and effort!

Please let the experimenter know that you are finished. S/he will give you a debrief of the experiment and hand over the voucher.